There is only one question I would like to ask: Dr. Ely has mentioned six different kinds of troubles or affections with which syphilis of the joints might be complicated or confused in making a diagnosis. I wonder if we might not add malignancy. I know that is more rapid in its development of symptoms and yet in my experience again and again have I called it into question in making the diagnosis.

Also another question I would like to ask the Doctor: "Would it not be well at times to assume the diagnosis to be tuberculosis instead of syphilis and possibly to put the joint at rest and note the results of that treatment, as well as to assume that it was syphilis and put the patients under the treatment of antisyphilitic remedies?"

Dr. Ely: Dr. Buteau's remarks are well taken. Malignancy is very frequent at the end of the bone and is difficult to distinguish from syphilis. As a rule, a malignant disease does not involve the joint. There are joints that are so typically tuberculosis that you will immobilize them and will not give antisyphilitic treatment. That is correct, and yet, if you do that, always be on the lookout to prove that you were wrong. Always look for bony thickening, for an enlarged spleen, for something that may suggest syphilis. All these diseases are liable to secondary infection. Tuberculosis, especially, runs its regular course. If proper treatment is not administered or in spite of proper treatment, the diseased area may break down and a secondary infection may be added to it. If a secondary infection be added, the diagnosis is easy. As a rule, the sinus in typical, but do not think that you can make an invariable diagnosis from the appearance of the sinus. This is another error that we have just struggled out of after many years. Very often there is the typical pale, flabby look of a tuberculosis sinus. A gonorrheal joint, as you know, may at any time become secondarily infected; so may a typhoid joint, a pneumococcus joint. Some are more liable to secondary infection than others.

What I have given you is not only the result of laboratory work, but it is a struggling out of a confusion, a graduation from an idea that especial acumen could be cultivated to diagnose these joints. We used to be taught that they were perfectly simple. If a patient was brought in with a chronic inflammation of a joint, it was assumed to be tuberculous. There was practically no discussion. It was put in plaster of paris, and it went on in its treatment for years. I would make a diagnosis of tuberculosis or gonorrhea or syphilis. Sometimes I would strike it right and sometimes I would strike it wrong, and then I was crestfallen. I thought it was my own stupidity. At Roosevelt Hospital, where we had quite an active clinical service and quite a friendly rivalry, when anything interesting like that came along, each man would make his diagnosis and would bet on it, and the youngest man in the clinic would be just as liable to upset the oldest as the oldest to upset the youngest. It seemed to be a mere matter of chance. Then I set to work with these joints that had been removed and I put them under the microscope. I collected their histories, found out the diagnoses that had been made upon them by various men, the operations that had been done by various men, and I found that about one-third of them had been erroneously diagnosed. In the vast majority of instances, perhaps one man showed a little better average than the others. Those joints included the work of some of the biggest men at that time in New York, some of them were my own joints. From that it soon became evident to me that the diagnosis could not be made on the usual lines. Then from that and a study of the pathology of joint tuberculosis, it dawned on me how the diagnosis should be made. It was not to be made by any general appearance of the bone, not by any particular, you might say general, appearance of the synovial membrane, not by any particular appearance of the marrow in gross. Submit a piece of a joint to a pathologist. He will look at these various tissues, and if he find a tubercle in the synovial membrane or in the marrow, he will say that it is tuberculosis. If he do not find a tubercle, he will call it chronic inflammation—non-tuberculous. The features of both are the same, and the only point that microscopy did for the diagnosis was to say "chronic inflammation," tuberculous, or non-tuberculous. If a man cannot make it in the clinic from an inspection of the joint, and the pathologist cannot make it except from the presence or absence of the tubercle, how can we make it? From the X-ray? Well, take your X-rays. Take the best men in X-ray diagnosis. Have them put their diagnoses down, have them follow their cases along. You will find the X-ray man cannot do it. The X-ray features are all the same. History? The man who will go deepest in the history will guess right more often. If he pulls up the patient's trousers, finds the knee swollen, and says chronic rheumatism from the appearance of the joint, he will miss it most often. Let him sit down and enquire into the patient's health—how many times he has had a Neisser infection; if he ever had syphilis; if he ever had pneumonia, typhoid fever; how many joints were involved and in what order; did the disease come on suddenly or slowly? Let him ask, "Are your parents alive?" "What is your occupation?" The deeper one goes into the history, the more often one will guess right. A thorough physical examination must be added, and the usual laboratory tests. Then one is in a position to guess right in the majority of instances. If one will then on top of hard thorough work and careful examination of his patient, recognize the fact that one cannot make a positive diagnosis, and if one will keep one's eye open to the possibilities of error, one will do as well as is possible.

THE TONSILS AS A FOCUS ON INFECTION.*

By JOHN MACKENZIE BROWN, M. D., Los Angeles, Cal.

It has long been recognized that the tonsil plays an important role along with many other structures of the body, as a possible site of focal infection. But it has been only during the past decade that sufficient emphasis has been laid on the relative importance of the tonsil in comparison with other focal lesions in the production of morbid processes in other locations, and general systemic diseases. The work of such men as P. K. Brown, Billings, Shaumbaugh, Rosenow and others, has demonstrated conclusively that many pathological conditions of obscure origin are due either directly, or indirectly, to bacterial or toxic absorption from pre-existing or active processes in the tonsil.

The question naturally arises, why are the tonsils so closely related to systemic infection? It is because they are probably the most often infected of any of the possible sites where pathogenic organisms may be harbored. And this susceptibility to infection appears to be mainly due to their anatomical structure and position.

The tonsil, situated as it is near the commencement of the alimentary tract, is surrounded at all times by a flora of both pathogenic and non-pathogenic germs of the mouth. The crypts pass deeply

* Read before the annual meeting of the California State Medical Society, Fresno, Cal., April 20th, 1916.

into the lymphatic tissue proper, in various directions, forming pockets or recesses in which microorganisms find warmth and moisture which plus lowered tissue resistance means multiplication and invasion. Again, many of these tonsillar culture tubes are long, narrow and branched, these facts together with the inclination of the crypts, favor stasis. Strictures become comparatively easy following even slight inflammatory conditions, thus producing pockets or foci where incubation may continue. In other words, the tonsil after a thorough infection becomes a veritable culture tube for the bacteria that inhabit it.

A word as to the bacteriology of the tonsil with respect to focal infection seems necessary to show, if possible, the etiological relationship between disease existing here and other acute and chronic manifestations. Recently Rosenow has published an extensive article on the elective localization of the streptococci, showing how focal lesions both acute and chronic, are responsible for many and varied systemic conditions. He states that foci of infection afford opportunity for bacteria to grow under varying degrees of oxygen pressure, and in mixed culture, both of which have been shown to cause changes in virulence and other properties of bacteria. He cites such systemic infections as rheumatic fever, appendicitis, and ulcer of the stomach, following the acute symptoms in follicular tonsillitis being caused by the streptococcus group of organisms. Rosenow's work was based upon animal experimentation, and he has apparently proved his results conclusively, by the finding in the focus, streptococci having elective affinities for the same structures in animals.

Davis of Chicago, by careful laboratory investigations of tonsils removed for various systemic disturbances, found hemolytic streptococci in twenty-eight cases of arthritis. In one case in association with pneumococci, in another with the streptococcus mucous. In ten cases of nephritis, nine showed hemolytic streptococci, pure or predominant in the crypts, so that these serve as examples of the predominance of the streptococcus group. Among other infecting organisms may be mentioned staphylococci, b. influenza, b. diphtheria, b. coli cummunis, and b. tuberculosis, the latter, it has been demonstrated by Wood, and others, can be made to invade and pass through the tonsil without producing tuberculosis of the tonsil itself.

Again Smith and Barrett have shown that the endamoeba buccalis has been found in the crypts and tonsillar tissue of extirpated tonsils, and they state that this organism is not only responsible for Riggs disease (pyorrhea alveolaris), but has many general manifestations as well.

The tonsil, I have emphasized, is one of the commonest containers of focal infection, and it necessarily follows that many acute and also chronic disturbances attributed to focal infections in general, applies to the infection of this organ, except with greater frequency. Inflammation of the tonsils has long been found to be associated with acute rheumatic fever, but not until the researches of Poynton and Paine was this relationship definitely understood as that of cause and effect, and now as Halsted of Syracuse states, clinicians and bacteriologists alike are agreed that the most common habitat of the micrococcus rheumaticus of Poynton and Paine is the tonsil. It may lie quiescent for months or years until the lowered vitality of the individual invites invasion, and then migration to a seat of election may occur in the joints, tendon sheaths, valvular endocardium, pericardium, or the central or peripheral nervous system.

Rosenow has produced appendicitis experimentally in animals by the injection of tonsillar extracts. He has produced in the same manner other lesions from various strains of streptococci.

In connection with chronic disease, the role played by focal infection from the tonsils seems quite as important, but research along this line has been still more recent. A few lesions, however, may be mentioned as at least influenced, if not caused, by intoxication or bacterial invasion from the tonsil. Probably heading this list would come the chronic arthritides upon which so much work has been done of late. I will admit mostly, in an empirical way, but in a review of the literature on this point, I find reported many cases of chronic deforming arthritis that have been greatly improved by enucleation of the tonsil, which in most cases showed the presence of the streptococcus hemolyticus.

Not only does the focal lesion in the tonsil seem to be responsible for the many chronic conditions, but writers have laid stress on the slow chronic intoxications or which really in many cases would come under Adami's group of sub-infections, which are undoubtedly responsible for many of the premature degenerative changes seen in many individuals and which produce effects varying from chronic indisposition to early degenerative changes in the cardiovascular and nervous systems and the chronic nephroses. Kyle, of Philadelphia, emphasizes asthma as a disease caused by toxic absorption from the tonsil, and Tschiassny reports a case of recurrent bronchial asthma in which removal of the tonsils resulted in a cessation of the attacks. Beck, of Chicago, also states that exophthalmic goitre undoubtedly is caused directly, or through alterations of the internal secretions by toxicity due to focal lesions of the tonsil. Again, to quote Billings, who says: "There is no doubt that the insidious, slow, degenerative processes which occur in many patients who arrive at the meridian of life are due to slow intoxication from chronic focal infections variously located, one of the most frequent of such focal infections being the tonsil."

It is not my intention in a paper of this length, to show how many different and varied conditions might hypothetically be caused by diseased tonsils, but how intimately some of the more important conditions are related in this way.

In any given case of acute or chronic disease thought to be due to tonsillar infection, after due consideration of other possible foci, how shall we arrive at a conclusion as to whether or not the tonsil should be removed?

In a case of acute tonsillitis complicated by an

intercurrent and seemingly directly associated condition, such for example as acute cardiac or renal disease, acute rheumatic fever, Sydenham's chorea, etc., the rational procedure seems a tonsillectomy.

In the case of chronic disorders the appearance of the tonsil often lends valuable information, the septic tonsil is frequently dark red in color, the crypts may be sealed over and superficial abscesses may be seen on its surface, the anterior and posterior pillars may be unduly adherent. Pus with cellular detritus, the result of previous tonsillar inflammation, may be squeezed from the crypts. The condition of the neighboring structures often gives additional evidence, the pillars may be of a deep red color, edematous, and lymphoid patches may be found on the posterior wall of the pharynx just back of the tonsil. The size of the chronic tonsil has nothing whatever to do with its relation to septic foci, in fact, the hypertrophic tonsil seems to be less a factor in the production of these various manifestations than the smaller imbedded tonsil. Again, in many cases what appears to be normal-looking tonsils when seen in situ, after enucleation I have found to contain pockets of pus hidden from the exterior.

In some cases I believe there is no way of telling whether or not the tonsil is infected so that if the external evidence does not seem sufficient to warrant removal for definite and recognizable lesions present, I strongly suggest the consideration of their removal if chronic infection or intoxication, seemingly points to this situation as the cause of trouble, after the careful exclusion of other possible foci. At the present state of our knowledge, regarding the connection between focal lesions, and metastatic infection and intoxication, I am inclined to take the empirialistic view, and look with suspicion on any tonsil found in an adult having unexplainable chronic symptoms. Here, I cannot emphasize too strongly, the necessity for thorough enucleation which is the teaching set forth by Billings. To leave the smallest portion of tonsillar tissue, means possibly a focus tightly sealed, when scar formation is complete, thus defeating our primary object. This fact explains the disappointing results seen in some cases, where a supposedly complete tonsillectomy did not give the promised relief. So the thought I want to leave with you, in this connection, is: Be just in judging; what by some is termed indiscriminate tonsillectomes, and study your series of cases which you count as failures, with this point in view. If this is done I think you will agree with me when I state that in conditions where you lay the fault to the tonsil, a thorough and careful enucleation is the only safe procedure to follow.

I wish to review briefly a few cases, although our highest hopes in every particular were not realized, however, in the main our efforts have been encouraging, and our course of action seems justifiable.

J. P., boy, age 7. Has had a superficial keratitis of the right eye for four years, during which time there were recurring attacks of acute tonsillitis, and associated with these attacks the eye condition became worse. The case was under the treatment of oculists during this time, but however the condition remained unchanged. The tonsils on examination were found diseased and their removal advised. One week after the tonsils were enucleated, the eye began to clear up, and was apparently normal in three weeks, and has remained so for the past four months.

A. P., age 22. Patient entered hospital complaining of headaches and weakness. Blood pressure 200 m.m. Urine showed considerable quantity of albumin with hyaline, and granular casts. Later he developed uraemic symptoms and at times became delirious. There was no history of acute nephritis or acute infectious disease, but a history of recurrent attacks of acute tonsillitis; on examination the tonsils were enlarged and clearly septic. Enucleation was advised, and done. The condition at this time was almost hopeless, as the kidney function was greatly impaired, and the patient's general condition was becoming rapidly and progressively worse. The results were quite unsatisfactory. The general condition did not improve, and the patient died three months later.

H. M., age 25. History of recurrent attacks of acute tonsillitis, the tonsils were supposedly removed three years previous. Acute nephritis a little over two years later, following acute tonsillitis. Albumin and casts have been constantly found in the urine since. Examination showed a small stub of one tonsil which was clearly septic, this was removed. His general condition commenced to improve immediately, also there was very much less albumin and fewer casts in the urine. At present time, a year and a half after the operation, he still has a trace of albumin and an occasional cast, but his general condition is excellent.

H. S., age 54. History of repeated attacks of tonsillitis all her life. At the age of 40 arthritic symptoms developed commencing in the meta carpal and phalangeal joints, the condition advanced rapidly with deformity and severe pain until a few years later she was a chronic invalid from arthritis deformans. The arthritic condition was always more painful during an attack of tonsillitis, which fact, along with local evidences in the tonsils seemed sufficient grounds for their removal; after enucleation the joint condition became stationary and the pain began to subside, she was able to do her own house work in six months later. At present, four years after operation, she is in good health, and comparatively free from joint disturbance.

M. S., age 22. During an attack of acute tonsillitis she developed an acute nephritis which gradually improved, but the urine continued to show the presence of red blood cells, granular casts, and a trace of albumin, and during the next six months there were several acute attacks with increase of all the kidney symptoms. The tonsils in the patient were chronically inflamed, and after the careful exclusion of all other possible foci, their removal was advised. Four years have elapsed since enucleation; the urine still shows a few red blood cells and granular casts, but the acute exacerbations have entirely ceased. The general condition is excellent.

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Discussion.

Sanford Blum, M. D.: The role played by infective foci in the etiology of endocarditis seems to be regarded as a new discovery. It is not very new. It has merely received wider recognition since it has been presented by men in more prominent positions; but the association has long been known and recognized. In 1902 I presented for a Master's degree, at the University of California, a thesis entitled "The Etiology of Endocarditis with Especial Reference to Bacterial Agencies." This paper was published in American Medicine, January 17, 1903, Vol. 5, No. 3, page 94 seq. In it I stated that "all bacteria pathogenic to the individual may cause endocarditis under the proper conditions. There must be a locus minoris resistential and the bacteria must be in the blood. They may enter the circulation from various sources—from an abscess of the foot (Winge's case), from the septic womb, from the intestines." But no single case of endocarditis has, so far as I am aware, been positively proved to have emanated from infected tonsils. Many cases of endocarditis have been discovered after tonsillitis, but post hoc does not prove propter hoc in these cases.

It has been stated to-day that when endocarditis exists, removal of infected tonsils (assumed to be the source of infection), should halt the process and prevent further destruction from the endocardium. Even if it should be assumed that the tonsils were the original focus from which the endocardium became infected—it seems illogical to conclude that, after the endocardium has become infected and a metastasis established, removal of the distant focus would check the process. Nor has tonsillectomy had this beneficent result in endocarditis cases which I have seen.

In a paper, "The Proper Position of Tonsillectomy in Pediatrics," read before the California Pediatric Society April 22, 1915, I cited cases of endocarditis beginning subsequent to tonsillectomy. Koplik (American Journal of Medical Sciences, July, 1912), reports similar observations. J. Herbert Young (Boston Medical and Surgical Journal, September, 1915) has published reports of 21 cases of tonsillectomy which he had under observation for two years following operation. Twelve of these cases had endocarditis before tonsillectomy, while 17 had endocarditis after tonsillectomy. In one case acute endocarditis was present, five days after operation in a child, whose heart had appeared normal before operation. In a second case endocarditis developed two weeks after tonsillectomy. The above quoted observations appear to imply that tonsillectomy not only does not prevent or check endocarditis, but may even be a factor in its causation.

Young's observations throw light on the relation of tonsillectomy to chorea. Of his 21 cases, 12 had chorea prior to tonsillectomy; 17 had chorea subsequent to tonsillectomy. Every case in which chorea was present before tonsillectomy, had from one to four attacks in the two-year observation period, subsequent to tonsillectomy, and five additional cases occurred after the operation. In the paper referred to above, "Proper Position of Tonsillectomy," I cited similar observations. These records indicate that the theory that tonsillectomy is a cure or preventive of chorea is false.

It is my privilege to acquaint Dr. Gundrum with an authentic case of endocarditis emanating from intestinal infection. In 1898, while serving in Escherisch's clinic in Graz, I saw an infant, which had pyocyaneus enteritis. There developed pyocyaneus septicemia and pyocyaneus endocarditis. Cultures of pyocyaneus bacilli were obtained from the feces and blood of the infant, and after its death, the same bacilli were identified in the verrucosities on the endocardium. Cultures obtained from the blood, were injected into the ear vein of a rabbit, of which I had lacerated the endocardium with a probe, introduced through the carotid, and pyocyaneus endocarditis developed in this rabbit. This case was published in the Centralblatt für Bakteriologie, Parasitenkunde, und Infektionskrankheiten, 1898, No. 25.

The tendency to condemn the tonsils, generally, as foci of infection should be criticised—as the theoretical benefits credited to tonsillectomy are not borne out by the facts. Simpson (Jour. A. M. A., April, 1915) observed, in Girard College, that scarlet fever and diphtheria occurred in the same proportions in tonsillectomized and untonsillectomized children. He reports also that a boy whose tonsils had been enucleated became a diphtheria carrier. There is at present (as I was to-day informed by Dr. O'Neill) in the San Francisco Isolation Hospital, a diphtheria carrier, who became such a year after tonsillectomy. It may be asserted that failure of tonsillectomy to fulfill its promises is due to faulty operation, but it is with tonsillectomy as it is performed that we have to deal.

FOCAL INFECTION INTESTINAL INVOLVEMENT.*

By F. F. GUNDRUM, M. D., Sacramento.

The development of a general invasion such as septicæmia or pyæmia from an originally localized bacterial infection has been a matter of medical observation and knowledge for many, many years. It has been but recently, however, that the relation of a once acute and now quiescent local infection to disease conditions in widely separated portions of the body has been recognized. Lubarsch has shown that a focal infection may remain dormant for a long time until some often extraneous event may bring about a new activity. The pioneer work in this field has been done for the most part by Billings, Rosenow, Davis, Jackson and others in this country. Their researches have shown that a local infection may become sufficiently chronic that it causes but comparatively slight disturbance in its own neighborhood, but may still give off active bacteria or toxins to the blood stream and produce lesions in remote structures. Further that organisms of the Strep-pneumo group may under some circumstances of oxygen supply undergo transmutation in type and pathogenicity.[1] Many different organisms have been isolated from lymph glands which lie upon the lymph channels

* Read at the Forty-fifth Annual Meeting of the Medical Society of the State of California, Fresno, April, 1916.